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AfREN Forum
31 May 2008 Rabat, Morocco

REN Connectivity

Connecting to the RENs of the World

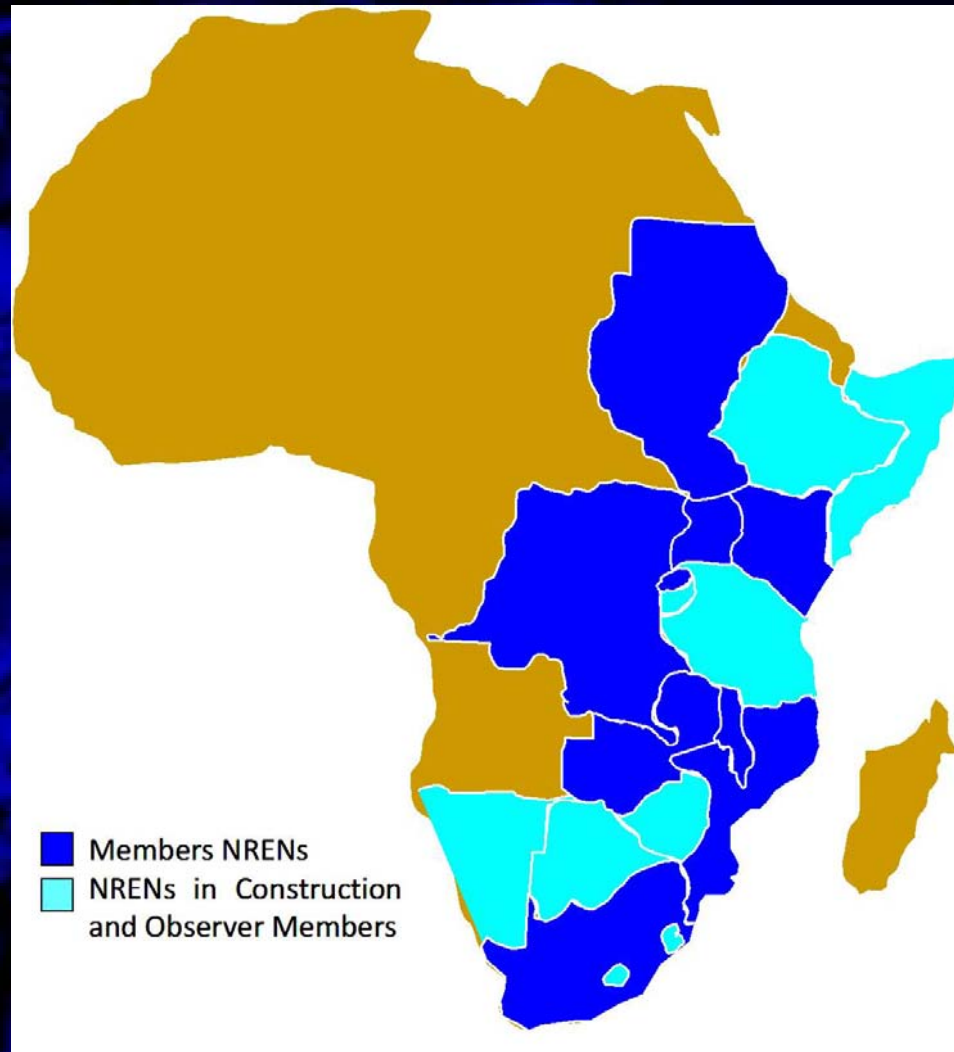
Duncan Martin

Director: UbuntuNet
Director and CEO: TENET

What is UbuntuNet?

- Regional REN
 - In principle: all African NRENs welcome
 - In practice: Mainly eastern and southern African NRENs
- Goals
 - Inter-connect member NRENs
 - Connect to other RENs world-wide
 - Businesslike relations with other African regional RENs (e.g. WA-RREN)
 - Interconnection agreements
 - Resource sharing agreements (e.g. Géant transit)

UbuntuNet Membership



UbuntuNet Office Bearers

- Chair: Prof Zimane Kadzamira (V-C, U of Malawi)
- Acting CEO: Eng Dr F F (Tusu) Tusubira
- Head of Secretariat: Margaret Ngwira (Secretariat located at U of Malawi, Lilongwe)

What RENs want to do

- Deploy and operate a national network that inter-connects member institutions
- Provide gateways and connections to other networks
- Provide ready access to content, computing power, mass-storage and other resources

Key component: Connecting to other networks

RENs

commodity networks

peering

transit

• **nationally**

• **regionally**

• **worldwide**



What distinguishes RENs among ISPs in Internet practice?

- ***Exclusive*** direct interconnections with other RENs

Exclusive?

Normally:

- *REN accept from other RENs only traffic destined for itself or other RENs.*

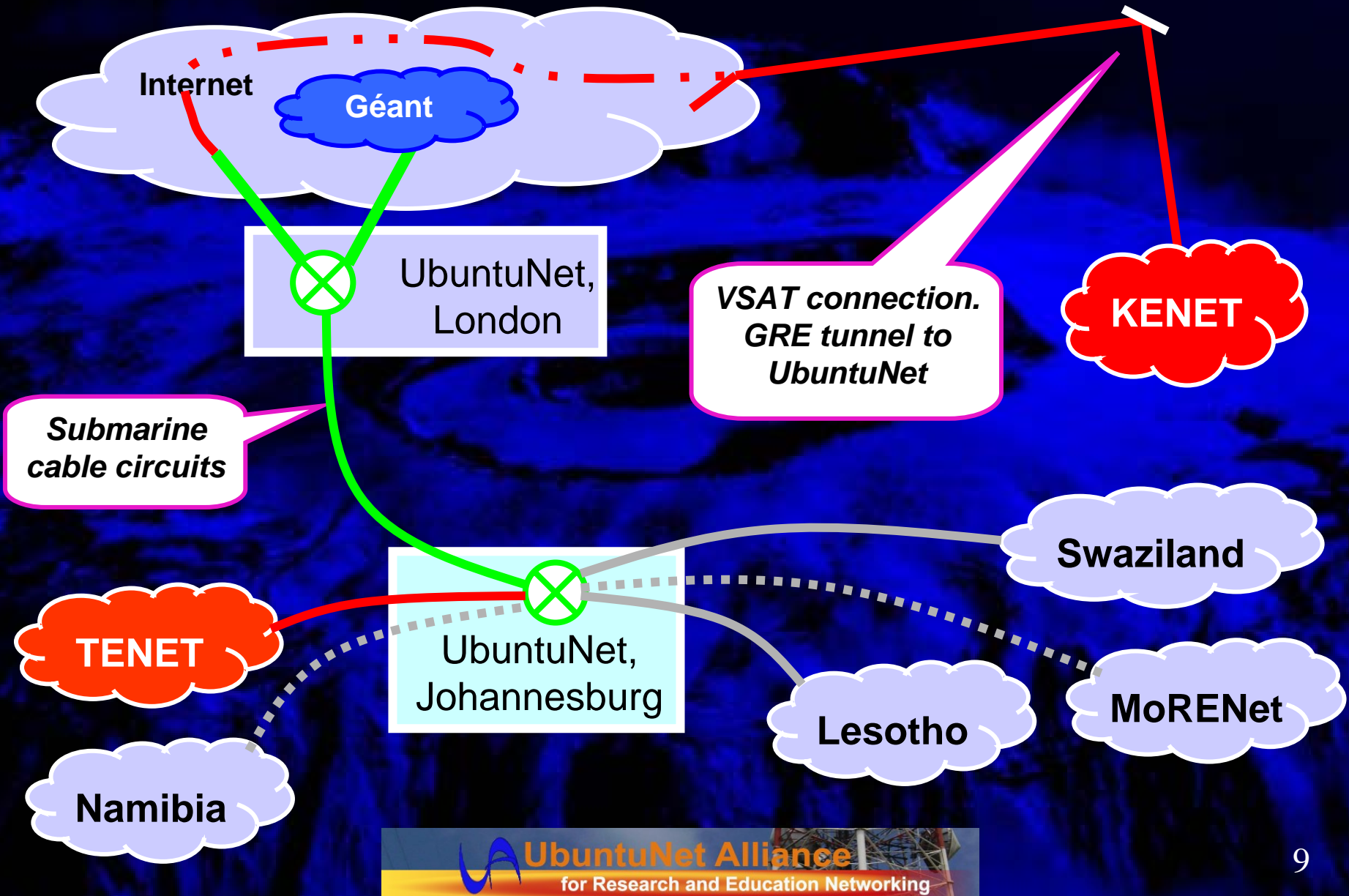
equivalently:

- *RENs don't transit traffic between other RENs and commodity destinations.*

equivalently:

- *RENs announce to other RENs only routes to REN destinations*

Example: UbuntuNet today



To do this requires...

- Each REN to have its own distinct network identity in the routing tables of the Internet
 - Autonomous System Number
- NRENs to be entitled to announce routes to the campuses of its members institutions
 - Campuses must use IP addresses that they control.

1st : IP addresses

- Most end sites rely on ISPs to connect them to the Internet
- ISPs operate their own networks, to which they connect their customers' sites/networks
- Normally, for purposes of Internet routing:
 - the ISP provides the customer with IP addresses
 - the customer's network is just part of the ISP's network
 - E.g. Intelsat provides a university with IP addresses

Problems with using IP addresses assigned by your ISP

- Cannot connect to RENs of the World
 - You're just part of a commercial ISP's network
 - The ISP's network cannot be announced to RENs
- Lock-in to your current ISP
 - If you want or need to change ISP, you'll have to re-number your campus networks

However...

- ISPs are quite content to let customers use their own IP addresses
- New blocks of IP address can be obtained from AfriNIC
- AfriNIC will apply a 50% discount to organisations that:
 - justify that they are official academic or research institutions in their countries;
 - demonstrate the exclusive use of assigned/allocated resources for not-for profit academic or research activities

AfriNIC fees for End-Sites (without discount)

Category	Allocation Size	Initial Setup fee	Membership (Annual)
Small	/24 to /20	USD 2,500	USD 100
Medium	> /20 to /19	USD 5,000	USD 100
Large	> /19 to /16	USD 7,500	USD 100
Extra Large	> /16 to /14	USD 10,000	USD 200
ASN		USD 400	USD 50



Conclusions so far

- Institutions should apply to AfriNIC for “End-Site” allocations of IP address space
 - They will have to renumber (assign new addresses to devices’ network interfaces)
 - AfriNIC requires a campus numbering plan
 - NRENs can assist with this
 - IPv4 and IPv6

2nd : Connecting NRENs

- Independent networks connect to each other by inter-connecting their “border routers”
- Border routers exchange route announcements using BGP
- Each network is identified by a unique Autonomous System Number (ASN)
 - Géant 20965; KENET 36914, TENET 2018, UbuntuNet 36944
- ASNs can be obtained from AfriNIC

NRENs must have...

- an ASN
 - to participate as independent network in peering and transit connections with RENS and ISPs generally
- A small end-site allocation of IP addresses
 - for numbering own router interfaces, servers etc.

Conclusions for NRENs

- NRENs should apply to AfriNIC for
 - An ASN
 - An “End-Site” allocations of IP address space for use on the NREN’s own network
 - IPv4 and IPv6
- UbuntuNet can assist

Thanks for listening!



UbuntuNet Alliance

for Research and Education Networking